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AUTHOR Burkholder, Jana N.
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ABSTRACT

The 32 citations in this annotated bibliography were identified by a review of the literature which addressed three questions: (1) is there a need for teacher training in the educational uses of computers? (9 citations); (2) what ideas and competencies should be considered when planning and implementing teacher training programs? (14 citations); and (3) what has been done to deal with this problem? (9 citations). The introduction includes a statement of the problem, purpose, organization, and limitations of the review of the literature which produced this bibliography, and a glossary of computer terms. A summary of the study which follows the citations presents these findings: (1) teachers themselves feel a need for increased training in the educational uses of computers, with current training more likely to occur in larger school districts; (2) lack of training and experience appear to be directly related to negative attitudes and lack of confidence towards computers; (3) effective preservice and inservice training programs seem to be successful in improving computer awareness and skills; and (4) competencies desirable for teachers to have include knowledge of hardware and software, experience with computer assisted and computer managed instruction, and the ability to evaluate computer software and the social and cultural implications of computer utilization. The study concludes with four recommendations for educational and government institutions to use in improving teacher training in computer use, a list of 13 competencies most frequently taught to teachers, a chart of the frequency of 15 competencies found to be necessary in teacher training programs, a list of 15 items that received a 66.7% or above acceptance rating as necessary in teacher training programs, and a bibliography. (JB)

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AN ANNOTATED BIBLIOGRAPHY OF THE LITERATURE DEALING WITH TEACHER TRAINING IN THE USES OF THE COMPUTER IN EDUCATION

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by

JANA N. BURKHOLDER

Graduate Student

Study Directed

by

Charles R. DuVall, Ph.D.

Submitted in partial fulfillment of the requirements
for the course E591--Exit Project
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TABLE OF CONTENTS

	Page
INTRODUCTION.	1
Statement of the Problem	2
Purpose of the Study	2
Organization	3
Limitations.	4
Glossary	5
ANNOTATIONS	
Is There a Need for Teacher Training in the Educational Uses of Computers?.	6
What Ideas and Competencies Should be Considered When Planning and Implementing a Teacher Training Program?.	11
What has Been Done to Deal With This Problem?	18
Summary, Conclusions, and Recommendations	24
Summary.	24
Conclusions.	27
Recommendations.	30
Appendixes	31
Bibliography.	34
Background.	38

INTRODUCTION

Society has accepted the role of the computer as more than just a fad which will soon be forgotten. It is a role which plays a major part in our society and must be included in the educational system in order to effectively prepare our youth for the types of career opportunities they will face. "In early May of 1983 the National Commission on Excellence in Education recommended that all secondary students be required to complete at least ½ year of computer science before graduating. . . . Along with this trend for students learning computer science comes the need for trained teachers who are qualified." (Barker, 1983) The uses of the computer in education far exceed computer science training though. The cost of computers is too high to not gain maximum benefits from the investment. Teachers who receive adequate training will use computers for more applications than just computer science education. As uses and needs are recognized, the funds will be wisely spent and the investment will be sound. It is easy to follow the trend by purchasing equipment, then find it not being used to its full extent because of a lack of knowledge. Administrators have recognized applications of the computer for their uses more than

classroom teachers have utilized it for instruction. (Anderson, 1983) The various instructional applications of computers need to be realized on a large-scale if the educational system hopes to provide for the technological advancement of this society. It means, therefore, that classroom teachers must receive training in this area.

STATEMENT OF THE PROBLEM

As schools take steps to purchase computers, teachers need to be prepared and trained in order to feel confident and use computers effectively in education. There is evidence that teachers' perceptions of computer applications in education are narrow without training. (Griswold, 1984) Teachers, themselves, have called for increased and improved teacher training (Stevens, 1983-84), recognizing that opportunities do exist but are limited by a lack of training. Various teacher training programs are possible through careful planning, by assessing needs, establishing goals, and identifying resources.

PURPOSE OF THE STUDY

The classroom teacher is given the responsibility of educating students according to a given curriculum. The teacher and the curriculum must provide for changes

and improvements to meet the changing needs of students. The computer can greatly assist teachers, as a tool for instructional techniques, as well as record keeping, and evaluation uses. The lack of teacher training is a major hindrance to computer use in education.

ORGANIZATION OF THE STUDY

This study looked at the issue of teacher training in the educational uses of computers, addressing three important questions. 1) Is there a need for teacher training in the educational uses of computers? 2) What ideas and competencies should be considered when planning and implementing teacher training programs? 3) What has been done to deal with this need?

The first question established that there is indeed a need for teacher training in the educational uses of computers. The second area offered competencies which have been determined to be most valuable for teachers and some important ideas to consider when planning a teacher training program. The final section of the study described several teacher training programs and actions which have been implemented, in an effort to offer useful suggestions when planning such a program.

LIMITATION OF THE STUDY

The problem of teacher training in the educational uses of computers has just recently been recognized. There was an abundance of computer-related research, however, only a small portion was dedicated to teacher training. What the available research did prove, was that this need is an urgent one which educators must carefully and critically consider.

GLOSSARY

computer assisted instruction (CAI) -- "the student receives direct instructional assistance from the computer." (Podemski 1981:31)

computer awareness -- "principles of computer operation, computer applications, social implications of computer usage, computer-related careers, and the future of computer usage." (Bitter 1983:6)

computer literacy -- "a collection of skills, knowledge, understandings, values and relationships". (Anderson 1982:9)

computer managed instruction (CMI) -- allows the teacher to "plan and monitor student learning" based on individual needs and differences. (Podemski 1981:31)

inservice training -- "provided by the local school district" for currently employed teachers. (Podemski 1981:29)

preservice training -- "concentrates on acquisition of basic content in the teacher's field of specialization and on development of generic teaching skills", provided by colleges of education for future teachers. (Podemski 1981:29)

ANNOTATIONS

IS THERE A NEED FOR
TEACHER TRAINING IN THE
EDUCATIONAL USES OF COMPUTERS?

Klassen, D.L., Anderson, R.E., Hansen, T.P., and Johnson, D.C. A Study of Computer Use and Literacy in Science Education, Final Report. Minnesota Educational Computer Consortium, St. Paul, 1981. (ERIC Document Reproduction Service No. ED 191 712.)

A study of teachers' attitudes was part of this research project conducted in Minnesota. A general response indicated that teachers felt good about using computers in education. When asked to respond to adequacy of their training, however, nearly one half felt that they had not been adequately prepared. These data revealed that teachers "generally feel positive about the value of computers in education. In terms of their own literacy regarding computers, many of them feel inadequately prepared to make decisions about using computers." (p. 45) These findings strongly supported a need for teacher training in educational computer uses.

Stevens, Dorothy Jo. "Research Summaries, Microcomputers: An Educational Alternative." Action in Teacher Education 5 (1983-84) : 53-57.

This study was administered in 1979, 81, and 82 and revealed that a large majority of the Nebraska teachers, teacher educators, and student teachers felt students should be computer literate, but only a few felt qualified to teach computer literacy. The teacher educator expected computer usage in schools to increase over the next ten to fifteen years with the effects being seen as early as 1985. Teachers surveyed did not expect computers to cause changes in classroom management and less than moderate change in their instructional techniques. Change in these techniques was accepted by 40%, however, 43% said they were not willing to change. The final survey reported that 72% of the subjects felt that there was a need for computer training. Teachers and teacher educators were more favorable of preservice programs than were student teachers. All subjects indicated a need for increased and improved programs to meet the need for teacher training.

Griswold, Philip A. "Computer Awareness and Attitudes of Prospective Rural Teachers." Rural Educator 5 (1984) : 11-15.

Griswold conducted research to explore attitudes toward computer awareness and applications held by teachers and prospective teachers in a rural area. Twenty ideas of computer awareness were presented and subjects responded in a range of strongly agree to strongly disagree. Results showed that 84% believed that computer influence cannot be escaped, and almost 75% felt that the typical person is unable to understand computers. 86% agreed that computers can improve the quality of education. However, the findings indicated that the subjects felt some degree of fear or apprehensiveness and only 41% felt that computers would improve individual teaching.

In general, the results indicated that these teachers and prospective teachers had relatively narrow perceptions of computer applications in education. "The perception was that the computer is another tool for use with simple tasks or routine duties. The sample, unlike a more computer-familiar group, viewed computers with negative attitudes." (p. 14) It was believed that the best way to alleviate these narrow perceptions was through teacher training.

Anderson, Cheryl A. "Computer Literacy: Changes for Teacher Education." Journal of Teacher Education 34 (1983) : 6-9.

Anderson described several studies which supported the idea that there is a great need for teacher training in computer literacy. A Fast Response Survey conducted in 1982 by the U.S. Department of Education found that in America's public schools 96,000 microcomputers and 24,000 computer terminals provide access to students. The study also determined that the majority of use was in secondary schools and was found in computer science and computer literacy training. Anderson attributed lack of teacher training to this limit on computer use.

Another study described by Anderson was conducted by Gillespie through a grant from the National Science Foundation and reported that in higher education, computers were used more for administration than instruction and research combined. Thus, more teachers need to be trained in order to increase instructional uses of computers.

Ernest, P.J. Educational Technology and Teacher Competence: Identification and Preservice Assessment. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology. Research and Theory Division, Dallas, Texas, May 2-7, 1982. (ERIC Document Reproduction Service No. ED 223 216.)

This study identified 69 educational technology competencies that teachers perceived as related to teaching effectiveness. A sample of teacher education programs revealed that more than half of these competencies were not being taught. Therefore, Ernest concluded that; "(a) media specialists, teacher educators, administrators, and teachers perceive educational technology competencies for teachers as highly important; and (b) graduates of the preservice preparation programs in Alabama have not utilized educational technology at the levels of importance established by the experts' and institutional representatives' perceptions." (p. 21) Increased training was suggested as the key to increasing the utilization of educational technology.

Schmizzi, Ned. "A Comparison of the Results of Two National Surveys." Action in Teacher Education 5 (1983-84) : 59-61.

This study was a nation-wide survey administered to 250 colleges and universities with teacher education departments and 400 school systems selected from the 50 states. It found that many of the problems faced by school systems are common to teacher education programs, concerning teacher training in computer literacy. Two major obstacles listed in incorporating computers into the instructional program were financial problems and a lack of prepared faculty. Finally, the study reported that long-range planning proved to be necessary for successful instructional applications. Teacher inservice programs should be considered as a part of this planning and successful implementation.

Ellis, James D. "A Rationale for Using Computers in Science Education." American Biology Teacher 46 (1984) : 200-06.

Dr. Ellis described a growing need for re-examination of educational goals and found Minnesota, California, North Carolina, Texas, Wisconsin, and Colorado as taking steps to develop guidelines in computer literacy. Ellis cited lack of teacher training as a significant barrier to large-scale implementation in schools and inservice training was said to require local, state, and federal funding. Ellis justified the improvement of teacher training programs in two ways: first, there is currently a low level of teacher knowledge and skill, and second, the key role played by the teacher in instruction. The cost of computers was said to be too high to simply provide hardware and software without providing the necessary preservice and inservice training to teachers. Educators must know how to not only use the computer but use it for effective instructional purposes.

Dickerson, L., and Pritchard, W. "Microcomputers and Education: Planning for the Coming Revolution in the Classroom." Educational Technology 21 (1981): 7-12.

This article highlighted a study in Florida's public schools which found that 60% of the districts which responded were using computers in the schools for instructional use, "but less than 40% provided or supported formal training for teachers in the instructional use of computers." (p. 10) The survey also indicated that the larger the school district, the more likely it was to use computers for instruction and the more likely it was to support or provide training for teachers. It was predicted that this could increase the gap between upper and lower economic groups and large and small school districts.

Bassler, Otto, Almeida, Maria, and VanVoorst, Conrad. Computer Education--A Survey of 7th and 8th Grade Teachers. Vanderbuilt University, Nashville, January, 1984. (ERIC Document Reproduction Service No. ED 238 696.)

In a metropolitan area of Tennessee, 122 teachers and principals responded to a survey to determine teachers' views on support of computer literacy programs in the 7th and 8th grades. The survey showed that a substantial number of teachers had no direct experience with computers (which indicated a need for teacher training before implementation of computers in the curriculum). A positive attitude was reported toward computer education in the 7th and 8th grades. A final finding indicated that experience with computers is directly related to feelings about computers--the more experience, the more confident and positive the attitude.

WHAT IDEAS AND COMPETENCIES SHOULD BE CONSIDERED WHEN PLANNING AND IMPLEMENTING A TEACHER TRAINING PROGRAM?

Barker, Bruce O. Computer Awareness for Rural Educators, Ephraim. Paper presented for the Annual Utah Small/Rural School Conference, Ephraim, Utah, August, 1983. (ERIC Document Reproduction Service No. ED 235 951.)

Barker cited the National Commission on Excellence in Education in 1983 when the Commission recommended that all secondary students be required to complete at least one half year of computer science before receiving a diploma. With this recommendation, educators can realize the seriousness of a lack of trained teachers. Barker's stress on computer awareness rather than computer literacy illustrated a practical and realistic view of the content of teacher training programs.

Barker described the need for qualified teachers as computer science training for students is implemented. He stressed computer awareness as "knowledge of computer history; a basic understanding of how computers work; an awareness of different types of computers, peripheral hardware that go with them, and software programs which are available for use; capabilities and limitations of computers, and a knowledge of how to retrieve information from a computer and actually use the machine. Computer literacy would include all of these, plus proficiency in programming." (p. 5)

Damarin, S.K. Technology in the Classroom: Initiative or Response? New Directions in Curriculum Development. Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education. Houston, Texas, 1982. (ERIC Document Reproduction Service No. ED 213 675.)

Three major issues that teacher educators must consider in addressing the effect of computers on curriculum and instruction were: "1) ways that the proliferation of computers and the growth of computer-related technologies can and should affect the content of curriculum and instruction. 2) How the availability of computers in schools can and should affect the quality of appropriate content. 3) The Technology and Basic Skills Project--Mathematics at Ohio State University addresses all three issues as they are related to the teaching of mathematical concepts and problem solving skills to middle grade students." (p. 4) These issues were found by Ohio State, to be necessary in teacher training programs. Damarin said "we must begin the task of preparing teachers for the computer age yesterday and must focus on the very best of what technology can offer to education--freedom for the teacher and student alike to pursue the ideal of an educated society." (p. 6)

Bitter, Gary G. A Scope and Sequence Curriculum (K-12) for Computer Literacy. Washington D.C., 1983. (ERIC Document Reproduction Service No. ED 235 792.)

Bitter cited teacher training as a prerequisite for effective computer literacy education. The Computer Literacy Planning Group, established by the District of Columbia's Public Schools, developed a set of objectives which, through studying teacher attitudes and curriculum, established a framework for computer literacy education. They were "1) to develop computer awareness among students, teachers, supervisors, and administrators . . .; 2) to develop an implement a computer literacy curriculum; 3) to develop greater employability skills among students by expanding programs which prepare them to enter jobs or advanced training for future jobs. . . .; 4) to design and implement a Computer Training Laboratory . . ." (p. 8) Another, more immediate, goal of the Group was to "provide meaningful exposure to computing topics and devices for as many teaching personnel as possible." (p..9)

Romaniuk, E.W., and others. Computers in Schools. The Report of the Minister's Task Force on Computers in Schools. Alberta, 1984. (ERIC Document Reproduction Service No. ED 240 980.)

This Task Force in Alberta, Canada, studied the school systems in Alberta in comparison to Minnesota, Texas, and California. Through surveys conducted over three consecutive years (1981-83) they concluded that "it is of utmost importance that the training of teachers in educational computing not be neglected." (p. 61) From the results, the Task Force estimated that only six percent of Alberta's 27,000 teachers "have a working knowledge of computers and are acquainted with their different applications." (p. 61) From these findings, the Task Force concluded that a preservice program should include: 1) an understanding of the social, cultural, and commercial implications of computers; 2) training in CAI and CMI; 3) an introduction to computer language, programming, and problem solving capabilities; 4) an introduction to courseware evaluation. A graduate program should include the above with credit available to those who have already attained these skills either in preservice programs or independently. Inservice programs should be developed to introduce this knowledge to practicing teachers where necessary.

Payne, Judith S. An In-Service Workshop That Helps Teachers Reduce Computer Anxiety. November, 1983. (ERIC Document Reproduction Service No. ED 238 840.)

A 1982 survey of Kentucky Home Economics teachers reported that computers were available in schools but that teachers had no training in the use of these computers. It also reported a desire for assistance in learning about them. The greatest stumbling block identified by the survey was fear of the computer or anxiety associated with it. Results showed the greatest needs were for "1) information on using computers in home economics, 2) helping teachers develop more computer awareness, 3) assisting teachers in overcoming computer anxiety, and 4) providing information on various types of computer hardware, In addition, teachers requested information on available software for the home economics classroom." (p. 4) A follow up survey was administered after inservice training and found the training to be very helpful in improving and updating teachers' skills.

Hilgenfeld, Robert. Computer Literacy: A Model Plan for Teacher Education in the Area of Instructional Applications of Computers. 1984. (ERIC Document Reproduction Service No. ED 240 995.)

This study presented 27 questions to teachers and the NCATE (National Council for the Accreditation of Teacher Education) in Colorado, Montana, and Wyoming. Fifteen of the 27 items received a 66.7% or above acceptance rating as necessary in teacher training programs (see Appendix A). The survey also revealed the five major concerns, in rank order, as: 1) Knowledge of Computer Managed Instruction, 2) Knowledge of Computer Assisted Instruction, 3) knowledge of Software Evaluation, 4) Knowledge of How and Where to Obtain Software, and 5) Knowledge of a Programming Language.

Dennis, J. Richard, and Kansky, Robert J. Instructional Computing. An Action Guide for Educators. Glenview: Scott Foresman and Co., 1984.

This study was concerned with the status of instructional computing in Wyoming. The study was distributed to all Mathematics and Science teachers, public-school administrators, and school counselors in Wyoming as well as various faculty members at the University of Wyoming. The results of the study led to a report containing fifteen recommendations ranging from how students should use the computer to action necessary in the Legislature. Several recommendations dealt with teacher training. These stated that Universities should provide workshops in the application of computers, preservice programs for all teachers and administrators should look at the educational uses, and all teachers should develop skills in designing and evaluating instructional material. The report noted that many teachers are demanding inservice training in computers and therefore, colleges must view this as an indicator of necessary preservice teacher-education programs.

Bartos, Robert, and Souter, Floyd V. Advances Made Toward Computer Literacy. 1983. (ERIC Document Reproduction Service No. ED 240 069.)

A questionaire was sent to 144 randomly selected school districts representing 47 states. 86% were returned with information which described administrative and instructional uses of computers in education. Bartos and Souter derrived, from the results, that the following were necessary areas of teacher training: 1) Time and assistance must be made available for teachers to become computer literate; 2) Media and guidance personnel need instruction in uses in their fields, including career guidance, testing, scoring, and record keeping; 3) Teachers should receive instruction in selecting appropriate instructional material, using the computer to stimulate higher order thinking, and using the computer as an instructional manager.

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Zuckerman, Robert A. "Computers and Teacher Training." AEDS Journal 16 (1983) : 123-30.

Dr. Zuckerman described several levels of computer use by teachers and stated that teachers should be trained in different ways to use computers in the classroom. He said "Teachers need to learn about the resources available to them as well as the knowledge and skills required to employ those resources effectively in the classroom." (p. 125) He explained two very important categories teachers should be trained in. First, the teacher should learn the knowledge and skills necessary to become a computer user and, secondly, a computer developer, able to develop courseware. His recommendation described a computer resource center established by a university in order to train both preservice and inservice teachers.

Jarchow, Elaine McNally, and Hunter, William A. Instructional Computing, A Needs Assessment of Iowa's K-12 Teachers and Administrators. Iowa State University of Science and Technology, September, 1983. (ERIC Document Reproduction Service No. ED 244 623.)

In 1983, Iowa's K-12 teachers and administrators participated in a needs assessment to determine needs, perceptions, and concerns related to computers in education. This research found that both the teachers and the administrators were positive and enthusiastic concerning all aspects of instructional computing. "Teachers perceive inservice topics to be beneficial . . . that preservice teachers should learn programming, and techniques to evaluate, select and use appropriate software. Many other computer related topics should also be included in a teacher education program. Teachers wish to use varied modes of computer assisted instruction and would appreciate curricular assistance in implementing these modes. They would also find the computer valuable in classroom management tasks. Both teachers and administrators believe that teachers should possess computer literacy characteristics." (p. 106)

Piper, Karen L. Teaching the Teachers: The Key to Instructional Word Processing, Plano. Computers in the New Curriculum. Proceedings of the Annual Conference of the Texas Computer Education Association, (4th, Austin, Texas, February 29 - March 3, 1984.), 1984. (ERIC Document Reproduction Service No. ED 243 455.), pp. 166-169.

Research was conducted to determine whether word processing skills would improve writing skills in sixth graders. The study produced results which indicated that "A major key to the effectiveness of the program was teacher training. The success of such an instructional word processing program may very well depend on teacher ability to: 1) recognize effective uses of instructional word processing, 2) learn how to use the program themselves, and 3) effectively introduce the program to students." (p. 166) After receiving instruction, teachers' responses to survey questions indicated that they had learned how to teach the word processing program but felt they needed more practice in order to feel completely comfortable.

Kemp, Linda. Essential Computer Competencies for Educators. Texas Education Agency, Austin, 1983. (ERIC Document Reproduction Service No. ED 234 746.)

"Acquisition of a basic set of computer competencies . . . is of increasing importance to educators in Texas public schools." (p. 7) This paper was published in order to serve as a guide for further study of computers in education. Kemp identified five competencies which teachers should possess: "a. characterize the use of the computer as an object of instruction, as an instructional medium, and as a problem solving tool; b. identify various options for using computers in an instructional setting . . .; c. differentiate between instructional computer applications such as drill-and-practice, tutorial, simulation, and problem solving; d. apply and evaluate the general capabilities of the computer as a tool for instruction; and e. use computer courseware to individualize instruction and increase student learning." (p. 10)

Signer, Barbara. Computer Literacy for Teachers, Houston. Computers in the New Curriculum. Proceedings of the Annual Conference of the Texas Computer Education Association, (4th, Austin, Texas, February 29 - March 3, 1984.), 1984. (ERIC Document Reproduction Service No. ED 243 455.), pp. 213-15.

A collection of responses from colleges and universities were examined from which Signer presented a list of 13 objectives which were being taught in various Colleges of Education. They were those competencies which appeared most frequently. (see Appendix B)

Griswold, Philip A. "Some Determinants of Computer Awareness Among Education Majors." AEDS Journal 16 (1983) : 92-103.

This study was conducted in order to determine whether computer awareness could be predicted in education majors. Three hypotheses were formulated to be tested. 1) Internal locus of control accounts for more variation in awareness than age, sex, or math skill. 2) More math skills and being male increase the chances of being more computer aware. 3) Younger individuals have a greater chance of being more computer aware. Subjects completed a series of questions which provided a scoring system of strongly agree to strongly disagree. Those individuals with an internal orientation or internal locus of controll were found to be more computer aware. Griswold explained that these individuals tend to be less intimidated by unfamiliar terminology and processes. They also tend to be "more perceptive and ready to learn about their surroundings." (p. 94)

The next best predictor was age, however, the hypothesis that younger individuals tended to be more computer aware was disproved. The hypothesis was based on the assumption that younger subjects had probably received more computer instruction at the elementary through high school levels. This was not true. Griswold explained that "high school graduates may not be exposed to computers to the extent suggested by the large numbers of computers available" in schools. (p. 98) Greater awareness was associated with males than females, attributed to the larger number of males in math related areas of study. The number of math courses an individual had taken was a significant contributor but arithmetic skill was not. Griswold concluded by stating that "anticipating such barriers and searching for others, " instructional strategies can be developed which take into account individual differences. With these differences in mind, educators can better prepare preservice and inservice programs to meet the needs of the classroom teacher and the future teacher.

WHAT HAS BEEN DONE TO DEAL WITH THIS PROBLEM?

Wholeben, Brent E., Ph.D. A Computer Literacy Curriculum for Preservice Teacher Education Candidates Ed. Della Bonnette. Baltimore: 1983. Paper presented for the Proceedings of the NECC/5 National Educational Computing Conference, Baltimore, June, 1983. (ERIC Document Reproduction Service No. ED 235 779.)

Dr. Wholeben discussed the importance of preservice computer training and offered a plan which was completed during the first half of the student teaching experience or internship. This allowed the preservice teacher to gain knowledge and at the same time be able to test, use, and evaluate this knowledge for practical application. The plan consisted of three components which followed a sequence. The first component was a four-hour, single session covering an introduction to microcomputers and their potential use in the classroom. The second component was focused on skill development. It consisted of four two-hour sessions which introduced the future teacher to hardware designs, software, and selection of hardware and software. The final component was a three-day program of twelve 1½-hour sessions covering more software, computer literacy, and CAI/CMI instruction on the first day. Day two presented specific instruction in computer assisted instruction programs and more software exposure. The third and final day dealt with evaluating software, round-robin scheduling of hardware and software demonstrations and sharing of ideas and problems encountered in the internship classroom.

The program was lengthier than some, so provisions for time needed to be carefully scheduled. A very important feature was that the program stressed the use of the computer in the classroom and in conjunction with the internship, provided practical and current practice for the future teacher.

Van Dusseldorp, Ralph. "A Successful Bootstrap Program for Infusion of Computer Competencies into a School of Education Curriculum." AEDS Journal 17 (1984) : 9-13.

In 1980, at the University of Alaska, Anchorage (UAA), a study found that the graduates in the School of Education received no preparation in using computers in education. Yet, these graduates were employed in schools where computers were available. The University found, also that they were not alone among Schools of Education; that many other universities were sharing these circumstances. As a result, many of these colleges began implementing programs of computer education into their curriculums in various ways. Van Dusseldorp described the UAA's plan which first decided to focus on preservice rather than inservice training. They placed importance on involving all faculty as much as possible and using microcomputers rather than the large computer owned by the University, since microcomputers were what the future teachers would be most likely to encounter in teaching. A computer lab was established by purchasing four Apple computers, then later purchasing four more. Graduate Assistants were hired on a part time basis to provide help in the lab. Faculty members were encouraged to use the lab and were allowed to check out computers and take them home or to their offices to become acquainted with software and hardware. Students, both graduate and undergraduate, were required to use the lab in order to complete a checklist of tasks, recorded by the Graduate Assistants. This was done at the same time a student was enrolled in a class which also dealt with computers in education. Upon completion of the tasks, students were permitted to use the lab during any hours, including when the Graduate Assistants were not present.

After the first year, most faculty members became familiar with the computers and the student requirements were revised to include more competencies.

Zgliczynski, Susan M., and others. Computer Education for Secondary School Teachers Ed. Della Bonnette. Baltimore: 1983. Paper presented for the Proceedings of the NECC/5 National Educational Computing Conference, Baltimore, June, 1983. (ERIC Document Reproduction Service No. ED 235 779.)

Zgliczynski, a faculty member in the School of Education, University of San Diego, described this institution's plan for including a computer education program in the undergraduate and graduate curriculum. Through a Faculty Research Grant, one faculty member developed modules of instruction, inserviced the faculty, and with faculty assistance, included the following in the program: 1) The Regular Teaching Credential Program was introduced to students in their first education class. Here, basic operation and uses were taught, including inappropriate uses. Students in later teaching methods classes were taught more specific selection, evaluation, and computer assisted instruction (CAI) program uses in their teaching fields. 2) All education majors were required to complete the Required Special Education Class in which they learned and used hardware and software designed for handicapped students. 3) In the Counseling Credential Course students gained instruction in career guidance software, test preparation and interpretation, word processing, and data management. 4) The Administrative Credential Course introduced selection and evaluation of hardware and software, school needs assessment, and hands-on training in the use of administrative packages to graduate students. 5) Doctoral students learned BASIC programming, word processing, and use of modelling packages in the Doctoral Program in Educational Leadership.

A goal of this implementation was that computer training would be received by every undergraduate, masters, and doctoral student within one year. The faculty members favored the system and after the first year, felt ready to present the modules with little or no assistance from the designer.

Burrows, Lodema, Dubitsky, Barbara. Microcomputers in Classrooms: Implications for Teacher Education. Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, (36th, San Antonio, Texas, February 1-4, 1984). (ERIC Document Reproduction Service No. ED 241 490.)

An experiment was conducted and described by Dubitsky, the purpose being to see the effects of Logo language in the classroom. Dubitsky traveled to several schools to train teachers in Logo. She modeled this training as she hoped they would use Logo in their classrooms. The teachers were taught mini-lessons which covered the same thing many times until they were comfortable with it. Teachers were also instructed to go at their own pace, repeating lessons as many times as necessary. These teachers returned to their classrooms and were evaluated as using Logo very successfully and creatively, in a way in which they had been instructed. Students were found to gain positive attitudes and a clear understanding of the language. In contrast, those teachers who were supplied Logo software but not instructed in a model program were teaching Logo to students who did not gain a clear understanding, creating negative attitudes, such as frustration, for both teacher and student.

Whittier Union High School. Computer Literacy--Staff Development. Whittier Union High School District, California: 1984. (ERIC Document Reproduction Service No. ED 239 613.)

This report described this high school's plan for an effective staff-development program. Because of budget restraints, the school was forced to include two meeting periods in the master schedule, one at the beginning of the day, labeled "A", and one at the end of the school day, labeled "Z". The school was offering, at the time, computer literacy courses to students with two computer literate instructors teaching the courses. Each of these teachers was assigned a meeting period, as were the remaining 70 teachers. By the end of the first semester, the entire teaching staff had received this computer literacy training. The second semester was used to incorporate a second phase -- implementing the computer in all areas of the curriculum. The administration did not feel the plan was perfect, but it did enable this high school to achieve a computer literate teaching staff.

Gahala, Estella. "Introducing Microcomputers in Schools: The Lyons Township High School Experience." Spectrum 1 (1983) : 38-41.

This article described this school district's plan for implementing a computer literacy program into its high school curriculum. Through a study, teachers were identified as having some knowledge, little knowledge, or no knowledge of computers. The teachers were trained during inservice workshops by outside consultants and other teachers. The teaching staff was organized into teams according to their previous knowledge and subject area taught. These teams were then assisted by computer programmers in order to develop appropriate courseware. The plan was found to be very successful due, in part, to the identification of faculty knowledge, and careful planning and use of results.

Kimbrough, Nancy. A Teacher Technologist Training Program, Houston. Computers in the New Curriculum. Proceedings of the Annual Conference of the Texas Computer Education Association, (4th, Austin, Texas, February 29 - March 3, 1984.), 1984. (ERIC Document Reproduction Service No. ED 243 455.), pp. 128-131.

The Houston Independent School District determined a need for personnel in implementing a computer literacy program. A position of Teacher Technologist was created to provide the Houston teachers with 296 hours of training and 30 update hours each year. Modules covered five categories; 1) Instructional Applications of the Computer; 2) Computer Literacy; 3) The Computer as a Tool; 4) Computer Languages; and 5) Planning and Implementation. Teachers were allowed to test out of any module by demonstrating a proficiency in the area.

Neights, Gary. "Pennsylvania's Statewide Initiative." Instructional Innovator 26 (1981) : 26-27.

Pennsylvania's plan, as described in 1981, provided for teacher training through its Instructional Materials Service (IMS) section of the Division of Intermediate Unit Services, part of the state Department of Education. The IMS conducted workshops for all levels of educators throughout the state. Phase one dealt with administrators, and covered topics pertinent to their role in computers in education, selection, evaluation, etc. IMS Directors were then trained, in turn, to train the teachers on a regional, local school level. Topics covered for teachers included familiarization and literacy training, programming training in BASIC, hardware and software evaluation and selection techniques, and provided some computers for loan. As new courses for teachers were developed, additional inservice was conducted. Phase three focused on training regional technicians in repairing computers to ensure maximum use in Pennsylvania's schools.

Christen, Kate, and Gladstone, Peggy. "E.L.'s Third Annual Survey of the United States." Electronic Learning 3 (1983) : 37-40.

This study in 1983 was a repeat of a 1981 study. In 1981 the "most often cited snag in the development of computer projects was the lack of adequate inservice training." (p. 38) With this still a concern, many states have given attention to training teachers. In 1983, sixteen states required or recommended a preservice or inservice program for teachers, and twenty other states were proposing requirements for consideration. The number of states involved in teacher training went from thirteen in 1981, to 40 in 1983.

In Indiana, the following legislative action was reported: A teacher training mandate was under consideration. It was mandated that schools teach computer literacy beginning with the 1984-85 school year. In 1983, $11 million was allocated for development of programs, including a regional clearing house/consortium. The Department of Education sponsored inservice workshops, the goal being to train 5,000 teachers per year. A state tax credit was made available for donation of hardware to schools.

SUMMARY

The research clearly proved that a need for teacher training programs in the educational uses of the microcomputer does exist. Klassen and Stevens found that teachers themselves, felt a need for increased training. Griswold (1984) determined that teachers' perceptions of the many uses of the computer in education were narrow and limited by a lack of training. Anderson (1983) supported this by citing a national survey which found computers used primarily in secondary, computer science courses, the area where the teachers were the most knowledgeable.

Ernest addressed the inadequacy of preservice training in Alabama, while Schmizzi found the need for both inservice and preservice training. He listed funding as a major obstacle. Ellis agreed, stating increased training would require funding from all levels of government.

Dickerson and Pritchard found teacher training more likely to be found in larger school districts along with increased use of computers for instruction. A lack of training and experience was found to be directly related to positive attitudes and confidence toward computers by Bassler, Almeida, and VanVoorst.

Schmizzi also found that the key to an effective teacher training program is careful planning. Many researchers have

listed ideas or competencies which should be included in a program. Barker stressed computer awareness rather than computer literacy which was supported by the findings of Bitter and Damarin. The awareness is a much broader and general knowledge than just knowing how to use the computer. It includes social implications, history, and instructional uses rather than just programming knowledge.

Payne, Hilgenfeld, Signer, Dennis and Kansky, and Bartos and Souter all found selecting appropriate software to be a necessary competency. Developing educational programs was also listed frequently by Dennis and Kansky, Zuckerman, Hilgenfeld, Jarchow and Hunter, and Signer.

Griswold (1983) went beyond competencies in planning a program to assessing determinants of computer awareness in education majors. He found that there were some factors in students which could predict computer awareness and felt that consideration of these determinants could help plan a program of training which would better suit the learner.

A preservice training program was described by Wholeben which was completed in conjunction with the student teaching experience. A major advantage of this program was that it allowed the preservice teacher to test and use this knowledge while learning the information. The preservice program

described by Van Dusseldorp involved a microcomputer lab where students were required to work, at their convenience, to complete a checklist of competencies. This proved to be very successful and the cost was thought to be very reasonable. Zgliczynski described a program at the University of San Diego in which students at the graduate and undergraduate levels received instruction from the faculty. The modules covered a range of information for use in several different teaching applications.

Burrows and Dubitsky reported on an inservice project in which teachers were instructed in a Logo program in the same way it was hoped they would teach it in their classrooms. It was later found that this method proved to be very successful. Students gained a clear understanding and positive attitude toward Logo, as conveyed by the teachers. Whittier Union High School and Lyons Township High School both used resources within their own systems to train their teachers. By assessing prior knowledge, both districts were able to determine needs and organize successful training programs. In Houston a Teacher Technologist position was created to address the need for teacher training. A system of training was established which provided initial training the first year and included update training each year thereafter.

Pennsylvania developed a statewide plan which Neights described as a series of workshops for all levels of educators. Directors were trained to, in turn, train teachers on a regional basis.

Christen and Gladstone have reported what actions state Legislatures have taken in order to address the issue of teacher training. They reported an increase in the number of states which have been involved in training teachers. Indiana has allocated funds for development of programs, a regional clearing house/consortium, and inservice workshops.

CONCLUSION

Is there a need for teacher training in the educational uses of computers?

The research indicated that there is an urgent need for teacher training in this area. Computers have been becoming more available to schools as more funds are allotted and the price continues to come within reach. Students are increasingly exposed to computers as personal computers become more common in homes. Computer science courses are offered in secondary schools at an increasing rate. If teachers are not properly trained to recognize and implement the uses of computers in education, then computers will not be utilized to the extent possible, and

eventually, society may find a void in its technological development. Training of society's future scientists begins long before the high school or college level. Therefore, teachers at all levels must be able to use computers effectively in education.

What ideas and competencies should be considered when planning a teacher training program?

From the research, one of the major areas of concern was that teachers need a knowledge of various applications of the computer in education. Utilization of the computer would be greatly increased in areas where previously it was limited or not used at all, if teachers were instructed in its possible uses. Other competencies concluded to be important were knowledge of hardware and software, computer assisted and computer managed instruction, evaluation of software, and social and cultural implications. A teacher training program would have increased success if these competencies were considered.

What has been done to deal with this need?

Several Colleges of Education have described their actions taken to implement teacher training in the educational uses of computers. The limited availability of such literature indicated, however, that much more training

is necessary. A preservice program would help train future teachers but a more urgent need exists each day in classrooms where untrained teachers are unable to use computers. Therefore, inservice programs seem necessary. Constant changes and improvements also suggest that update training would be beneficial by providing teachers with opportunities for changes and improvements as well. This research has shown that possibilities for inservice training exist within a school corporation, or even a single school building, if the goals are established and the resources are identified.

RECOMMENDATIONS

It is recommended that:

1. Colleges and Universities assume the responsibility of providing training for future teachers in the uses of the computer in education.
2. All levels of government assist educators in teacher training by providing funds where possible.
3. School corporations take action to train teachers in the educational uses of the computer.
4. School corporations allot funds for the purchase of appropriate hardware and software.

FIFTEEN ITEMS WHICH RECEIVED A 66.7% OR ABOVE ACCEPTANCE RATING AS NECESSARY IN TEACHER TRAINING PROGRAMS AS FOUND BY HILGENFELD

1) The availability of computerized teaching materials (i.e., instructional programs) in a variety of subject matter fields.

2) The integration of computerized teaching materials into existing curriculum, K-12.

3) The functioning of CMI (computer-managed-instruction) systems.

4) The application of computerized drill or practice in a variety of teaching situations.

5) The uses of simulations as teaching tools.

6) The evaluation of the effectiveness of a course that uses computerized teaching materials.

7) Procedures for determining the computer needs of your school.

8) Procedures for using instructional games appropriately and effectively in teaching.

9) Hands-on experience in the everyday operation and use of a range of different machines.

10) Hardware trouble-shooting procedures and means of access to professional help, i.e., knowing how to determine if a piece of equipment is ailing, and if it is, knowing who to call to fix it.

11) Identifying sources for computer materials (hardware, software, and supplies).

12) Techniques for evaluating the effectiveness of specific instructional computer programs.

13) The examination of alternative uses of computers in schools, e.g., as class-record-keepers, term-paper-editors, etc.

14) Knowledge of where computer programming fits into the total area of computer literacy.

15) The techniques for teaching problem-solving, with the use of the computer as an aid.

APPENDIX B

THIRTEEN COMPETENCIES MOST FREQUENTLY TAUGHT AS FOUND BY SIGNER

1) An understanding of a microcomputer's component parts.

2) The knowledge of what microcomputers can and cannot do in a computer based educational system.

3) The identification of the impact microcomputers will have on present and future education.

4) Information on the availability of inexpensive educational resources.

5) The opportunity to examine software that is available for instructional and management uses.

6) Training on how to evaluate instructional managerial programs.

7) Training on how to modify instructional/managerial programs.

8) Instruction on how to write instructional/managerial programs.

9) Training on how to use the microcomputer as a tool
   a. word processor
   b. information management.

10) Instruction on how to use the microcomputer as a tutee (logo).

11) Instruction on how to use microcomputers as aids in problem solving.

12) A knowledge of the effects of computers on individuals and society.

13) A knowledge of the history of computers.

APPENDIX C

FREQUENCY OF COMPETENCIES FOUND TO BE NECESSARY IN TEACHER TRAINING PROGRAMS

	Barker	Damarin	Bitter	Romaniuk	Payne	Hilgenfeld	Dennis, Kansky	Bartos, Souter	Zuckerman	Jarchow, Hunter	Piper	Kemp	Signer
Computer Awareness (uses)	x		x		x				x	x	x	x	
Computer Programming	x		x	x		x			x				x
Knowledge of Hardware	x		x		x	x						x	x
Knowledge of Software	x	x	x		x	x		x		x		x	x
Software Evaluation	x			x		x	x	x		x	x		x
Designing Software							x		x				x
Availability of Software					x	x							x
CAI				x		x		x		x		x	x
CMI				x		x		x		x		x	x
Various Applications		x			x	x	x	x		x	x	x	
Classroom Management						x		x		x			x
Needs Assessment						x							
Social and Cultural Implications	x	x		x		x							x
Computer Anxiety					x								
Availability of Time and Funding Assistance								x					

BIBLIOGRAPHY

Anderson, Cheryl A. "Computer Literacy: Changes for Teacher Education." Journal of Teacher Education 34 (1983) : 6-9. (1,7,24)

Anderson, Cheryl A. Computer Literacy: Rationale, Definition and Practices. Paper presented at a Satellite Teleconference on Microcomputers in Education, (Austin, Texas, October 28-29, 1982). (ERIC Document Reproduction Service No. ED 228 983.) (5)

Barker, Bruce O. Computer Awareness for Rural Educators, Ephraim. Paper presented for the Annual Utah Small/Rural School Conference, Ephraim, Utah, August, 1983. (ERIC Document Reproduction Service No. ED 235 951.) (1,11,25,33)

Bartos, Robert, and Souter, Floyd V. Advances Made Toward Computer Literacy. 1983. (ERIC Document Reproduction Service No. ED 240 069.) (14,25,33)

Bassler, Otto, Almeida, Maria, and VanVoorst, Conrad. Computer Education--A Survey of 7th and 8th Grade Teachers. Vanderbuilt University, Nashville, January, 1984. (ERIC Document Reproduction Service No. ED 238 696.) (10,24)

Bitter, Gary G. A Scope and Sequence Curriculum (K-12) for Computer Literacy. Washington D.C., 1983. (ERIC Document Reproduction Service No. ED 235 792.) (5, 12,25,33)

Burrows, Lodema, Dubitsky, Barbara. Microcomputers in Classrooms: Implications for Teacher Education. Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, (36th, San Antonio, Texas, February 1-4, 1984). (ERIC Document Reproduction Service No. ED 241 490.) (21,26)

Christen, Kate, and Gladstone, Peggy. "E.L.'s Third Annual Survey of the United States." Electronic Learning 3 (1983) : 37-40. (23,27)

Damarin, S.K. Technology in the Classroom: Initiative or Response? New Directions in Curriculum Development. Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education. Houston, Texas, 1982. (ERIC Document Reproduction Service No. ED 213 675.) (11,25,33)

Dennis, J. Richard, and Kansky, Robert J. Instructional Computing. An Action Guide for Educators. Glenview: Scott Foresman and Co., 1984. (14,25,33)

Dickerson, L., and Pritchard, W. "Microcomputers and Education: Planning for the Coming Revolution in the Classroom." Educational Technology 21 (1981) : 7-12. (9,24)

Ellis, James D. "A Rationale for Using Computers in Science Education." American Biology Teacher 46 (1984) : 200-06. (9,24)

Ernest, P.J. Educational Technology and Teacher Competence: Identification and Preservice Assessment. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology. Research and Theory Division, Dallas, Texas, May 2-7, 1982. (ERIC Document Reproduction Service No. ED 223 216.) (8,24)

Gahala, Estella. "Introducing Microcomputers in Schools: The Lyons Township High School Experience." Spectrum 1 (1983) : 38-41. (22,26)

Griswold, Philip A. "Computer Awareness and Attitudes of Prospective Rural Teachers." Rural Educator 5 (1984) : 11-15. (2,7,24)

Griswold, Philip A. "Some Determinants of Computer Awareness Among Education Majors." AEDS Journal 16 (1983) : 92-103. (17,25)

Hilgenfeld, Robert. Computer Literacy: A Model Plan for Teacher Education in the Area of Instructional Applications of Computers. 1984. (ERIC Document Reproduction Service No. ED 240 995.) (13,25,31,33)

Jarchow, Elaine McNally, and Hunter, William A. Instructional Computing, A Needs Assessment of Iowa's K-12 Teachers and Administrators. Iowa State University of Science and Technology, September, 1983. (ERIC Document Reproduction Service No. ED 244 623.) (15,25.33)

Kemp, Linda. Essential Computer Competencies for Educators. Texas Education Agency, Austin, 1983. (ERIC Document Reproduction Service No. ED 234 746.) (16,33)

Kimbrough, Nancy. A Teacher Technologist Training Program, Houston. Computers in the New Curriculum. Proceedings of the Annual Conference of the Texas Computer Education Association, (4th, Austin, Texas, February 29 - March 3, 1984.), 1984. (ERIC Document Reproduction Service No. ED 243 455.), pp. 128-131. (22,26)

Klassen, D.L., Anderson, R.E., Hansen, T.P., and Johnson, D.C. A Study of Computer Use and Literacy in Science Education, Final Report. Minnesota Educational Computer Consortium, St. Paul, 1981. (ERIC Document Reproduction Service No. ED 191 712.) (6,24)

Neights, Gary. "Pennsylvania's Statewide Initiative." Instructional Innovator 26 (1981) : 26-27. (23,27)

Payne, Judith S. An In-Service Workshop That Helps Teachers Reduce Computer Anxiety. November, 1983. (ERIC Document Reproduction Service No. ED 238 840.) (13, 25,33)

Piper, Karen L. Teaching the Teachers: The Key to Instructional Word Processing, Plano. Computers in the New Curriculum. Proceedings of the Annual Conference of the Texas Computer Education Association, (4th, Austin, Texas, February 29 - March 3, 1984.), 1984. (ERIC Document Reproduction Service No. ED 243 455.), pp. 166-169. (16,33)

Podemski, Richard S. "Computer Technology and Teacher Education." Journal of Teacher Education 32 (1981) : 29-33. (5)

Romaniuk, E.W., and others. Computers in Schools. The Report of the Minister's Task Force on Computers in Schools. Alberta, 1984. (ERIC Document Reproduction Service No. ED 240 980.) (12,33)

Schmizzi, Ned. "A Comparison of the Results of Two National Surveys." Action in Teacher Education 5 (1983-84) : 59-61. (8,24)

Signer, Barbara. Computer Literacy for Teachers, Houston. Computers in the New Curriculum. Proceedings of the Annual Conference of the Texas Computer Education Association, (4th, Austin, Texas, February 29 - March 3, 1984.), 1984. (ERIC Document Reproduction Service No. ED 243 455.), pp. 213-15. (7,25,32,33)

Stevens, Dorothy Jo. "Research Summaries, Microcomputers: An Educational Alternative." Action in Teacher Education 5 (1983-84) : 53-57. (2,6,24)

Van Dusseldorp, Ralph. "A Successful Bootstrap Program for Infusion of Computer Competencies into a School of Education Curriculum." AEDS Journal 17 (1984) : 9-13. (19,26)

Whittier Union High School. Computer Literacy--Staff Development. Whittier Union High School District, California: 1984. (ERIC Document Reproduction Service No. ED 239 613.) (21,26)

Wholeben, Brent E., Ph.D. A Computer Literacy Curriculum for Preservice Teacher Education Candidates Ed. Della Bonnette. Baltimore: 1983. Paper presented for the Proceedings of the NECC/5 National Educational Computing Conference, Baltimore, June, 1983. (ERIC Document Reproduction Service No. ED 235 779.) (18,25)

Zgliczynski, Susan M., and others. Computer Education for Secondary School Teachers Ed. Della Bonnette. Baltimore: 1983. Paper presented for the Proceedings of the NECC/5 National Educational Computing Conference, Baltimore, June, 1983. (ERIC Document Reproduction Service No. ED 235 779.) (20,26)

Zuckerman, Robert A. "Computers and Teacher Training." AEDS Journal 16 (1983) : 123-30. (15,25,33)

Jana N. Burkholder

P.O. Box 148

Wyatt, IN 46595

Phone (219) 633-4943

EDUCATIONAL BACKGROUND:

Ball State University, Muncie, Indiana	1976-1980	Bachelor of Science Major: Elementary Education

EMPLOYMENT:

1980-1981	Substitute Teaching South Bend Community School Corporation Polk-Lincoln-Johnson School Corporation
1981-1985	fourth grade teacher John Glenn School Corporation